Powerwave Technologies, Inc.

TEST REPORT FOR

Nexus Dual Band Repeater, RH905022/13B

Tested To The Following Standards:

FCC Part 27 Subpart C
and
RSS-131

Report No.: 91026-5

Date of issue: July 30, 2010

ACCREDITED

TESTING
CERT #803.01, 803.02, 803.05, 803.06

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Powerwave Technologies
1801 E. St. Andrew Place
Santa Ana, CA 92705

Representative: Sean Doan
Customer Reference Number: 137301

REPORT PREPARED BY:

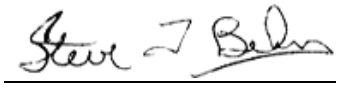
Dianne Dudley
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 91026

DATE OF EQUIPMENT RECEIPT: July 27, 2010
DATE(S) OF TESTING: July 27-28, 2010

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
110 Olinda Place
Brea, CA 92823

Site Registration & Accreditation Information

Location	Japan	Canada	FCC
Brea A	R-2945, C-3248 & T-1572	3082D-1	90473

SUMMARY OF RESULTS

Standard / Specification: FCC Part 27 Subpart C

Description	Test Procedure/Method	Results
RF Power Output	FCC Part 27C/2.1046/27.50(d)(1)	Pass
Occupied Bandwidth Input / Output	FCC Part 27C/ 2.1049(I)	Pass
Spurious Emissions at Antenna Terminal	FCC Part 27C /2.1051/90.210(m)	Pass
Field Strength of Spurious Radiation	FCC Part 27C/2.1053/27.53 (h)	Pass
FCC_Bandedge	FCC Part 27C	Pass
FCC_Out of Band Rejection	FCC Part 27C	Pass
99% Bandwidth	RSS-131	Pass
Amplifier Gain and Bandwidth	RSS-131	Pass

Conditions During Testing

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

EQUIPMENT UNDER TEST

Nexus Dual Band Repeater
Manuf: Powerwave Technologies, Inc.
Model: RH905022/13B
Serial: NA

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

Pre Amp
Manuf: Minicircuit
Model: ZHL4240_SAM
Serial: D092397-19

Optical Converter Module
Manuf: Powerwave Technologies, Inc
Model: NA
Serial: NA

Signal Generator
Manuf: Aeroflex
Model: IFR343B3
Serial: 3410051078

Spectrum Analyzer
Manuf: Agilent
Model: 8561EC
Serial: 3946A00167

FCC PART 27 SUBPART C

This report contains EMC emissions test results under United States Federal Communications Commission (FCC) 47 CFR 15C requirements for Unlicensed Radio Frequency Devices, Subpart C - Intentional Radiators.

TEMPERATURE AND HUMIDITY DURING TESTING
The temperature during testing was within +15°C and + 35°C.
The relative humidity was between 20% and 75%.

2.1046/27.50(d)(1) - RF Power Output

Test Set Up

The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical in port is connected to a support Optical converter. The Support optical converter receives RF signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates an RF signal.
The insertion loss of the RF attenuator was measured and entered as a measurement offset of the power meter.

27.50(d)(1) RF Power Output:
Effective radiated power limits

d) The following power and antenna height requirements apply to stations transmitting in the 1710-1755 MHz and 2110-2155 MHz bands: (1) The power of each fixed or base station transmitting in the 2110-2155 MHz band and located in any county with population density of 100 or fewer persons per square mile, based upon the most recently
Available population statistics from the Bureau of the Census, is limited to a peak equivalent isotropically radiated power (EIRP) of 3280 watts. The power of each fixed or base station transmitting in the 2110-2155 MHz band from any other location is limited to a peak EIRP of 1640 watts. A licensee operating a base or fixed station utilizing a power of more than 1640 watts EIRP must coordinate such operations in advance
with all Government and non-Government satellite entities in the 2025-2110 MHz band. Operations above 1640 watts EIRP must also be coordinated in advance with the following licensees within 120 kilometers (75 miles) of the base or fixed station: all Broadband Radio Service (BRS) licensees authorized under part 27 in the 2155-2160 MHz band and all AWS licensees in the 2110-2155 MHz band.

Effective:
June 2, 2008
1) Power measurements, for transmitters authorized under these sections, may be made either in accordance with a Commission- approved average power technique,
or using peak power measurements.

2) If an average power technique is used, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

The EUT is a RF amplifier/repeater. The manufacturer does not provide an antenna for sale with the product, hence EIRP is not measured nor calculated. The end user of this product is to exercise proper engineering judgment to select the appropriate antenna to comply with the EIRP limitation set forth by 27.50(b)

Engineer Name: E. Wong

Test Equipment				
Equipment	**Serial**	**Cal Date**	**Cal Due**	**Asset**
RF Power meter	GB37170458	01/26/10	01/26/12	02778
Power Sensor	MY41502826	01/26/10	01/26/12	03072

Test Data

Modulation: WCDMA (3GPP)

Frequency	Measured Power (W)
2113.0	20
2132.5	20
2152.0	20

Note: The RF power of the EUT was measured at the antenna port. The measurement satisfies the above requirement by demonstrating the measured power is below 1640 watts.

RF output port Service 1
Operating range: 2100-2155MHz.

In Addition:
The Peak to Average Ratio was measured with a spectrum analyzer in accordance with FCC guideline. Complementary cumulative distribution function (CCDF) function of the spectrum analyzer was employed, with the measurement bandwidth set at 8 MHz to capture emission within 4 MHz above and below the center frequency.

Reference
October,
2008 TCB Workshop 3 Rule Interpretations rule Interpretations Biennial Regulatory Review – Amendment of Parts 24, and 27 – (FCC 08- 85)

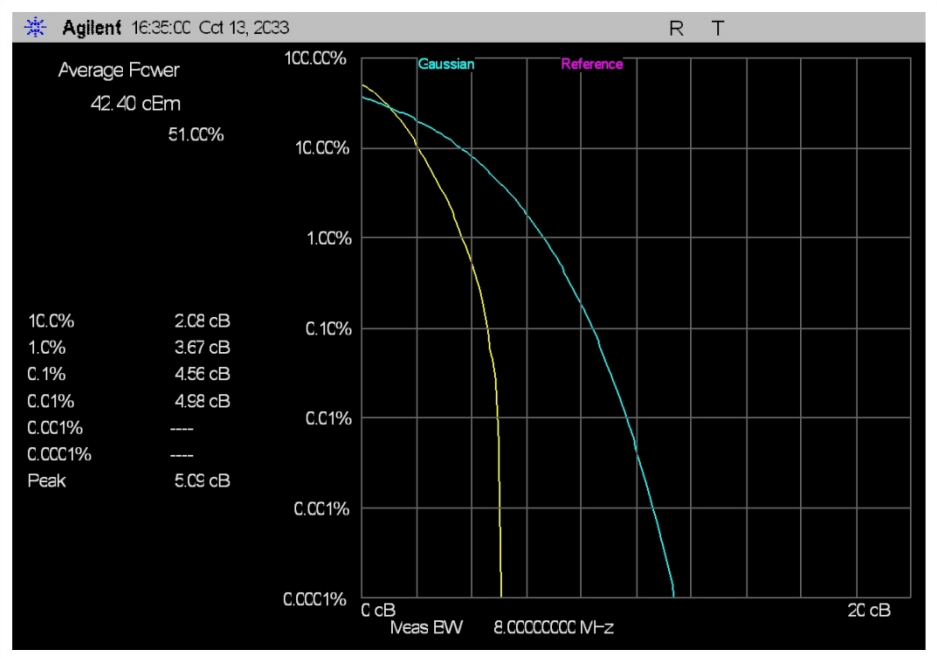
NOTICE OF PROPOSED RULE MAKING AND ORDER: Effective: June 2, 2008
1) Power measurements, for transmitters authorized under these sections, may be made either in accordance with a Commission-approved average power technique, or using peak power measurements.

2) If an average power technique is used, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

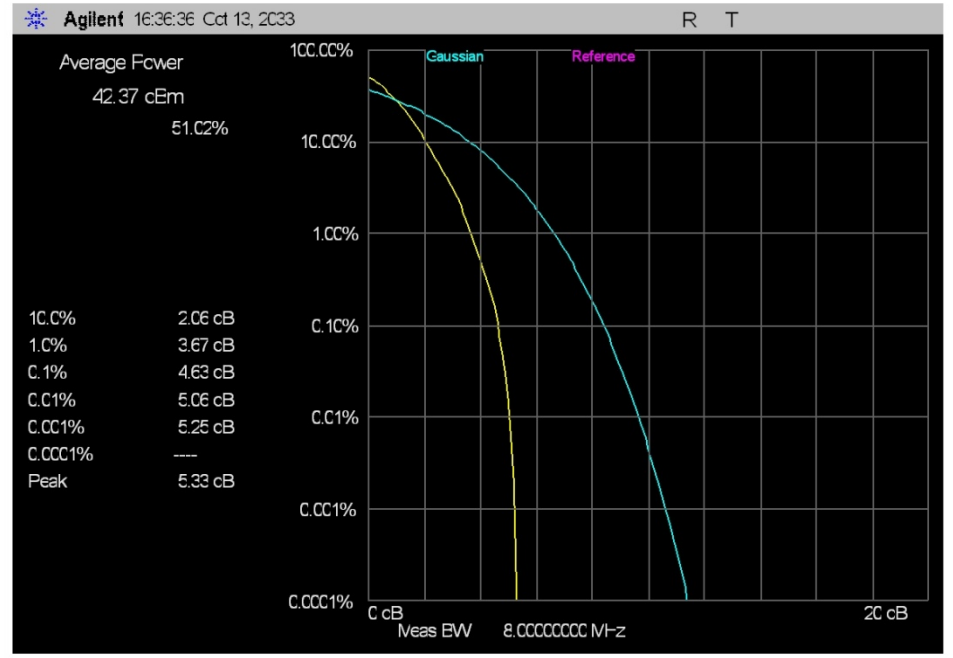
3) Affects (Part 24) 1850- 1915 /1930- 1995 MHz – PCS bands, and (Part 27) 1710- 1755 / 2110- 2155 MHz - AWS bands.

4) Power measurements techniques need to be finalized. FCC developing 13 dB PAR test method using CCDF analyzer function.

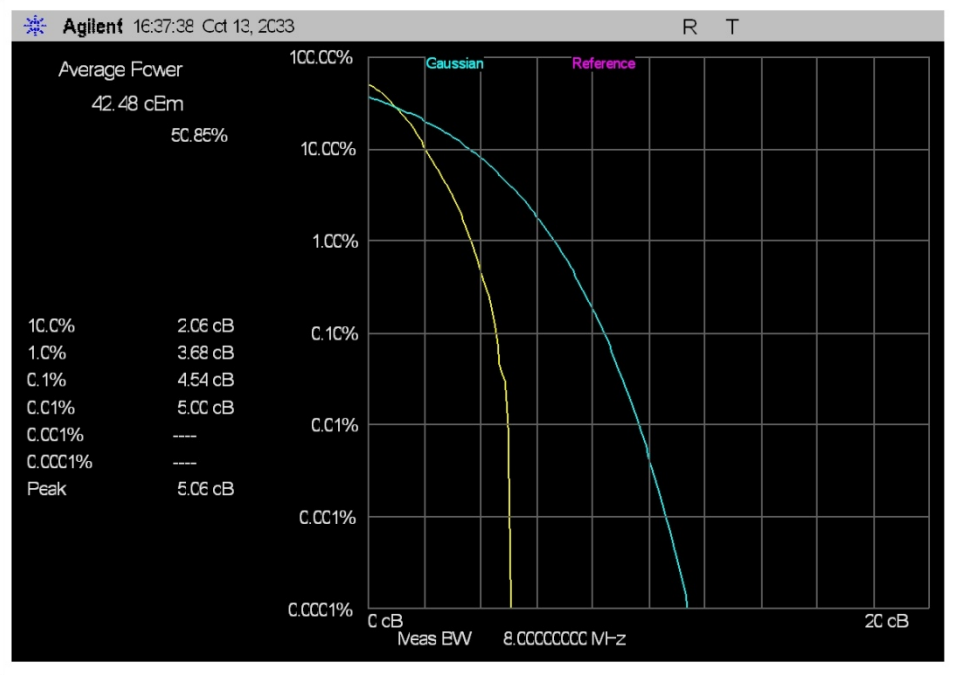
Test Data



PAR_WCDMA_2113MHz



PAR_WCDMA_2132MHz



PAR_WCDMA_2152MHz

Test Setup Photos

RF POWER OUTPUT TEST SET UP

2.1049(I) - Occupied Bandwidth Input / Output

Test Set Up

The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical in port is connected to a support Optical converter. The Support optical converter receives RF signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates an RF signal.

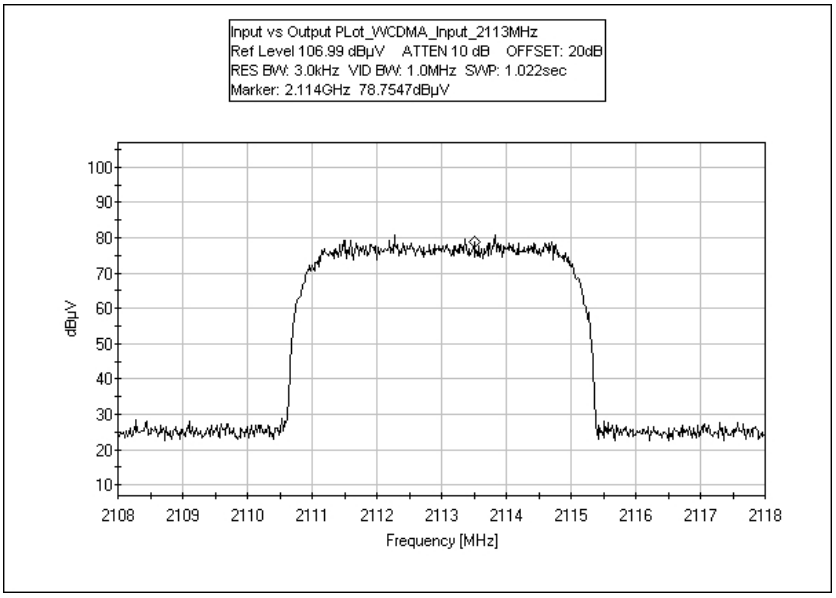
Operating range: 2110-2155MHz.
Modulation: WCDMA
Freq = 2113MHz, 2132.5MHz, 2152MHz

Output waveform is recorded with a spectrum analyzer at the Antenna port of the device.
Input waveform is recorded with a spectrum analyzer at the RF out of the support ESG.
The insertion loss of the RF attenuator was measured and compensated as measurement offset of the spectrum analyzer.

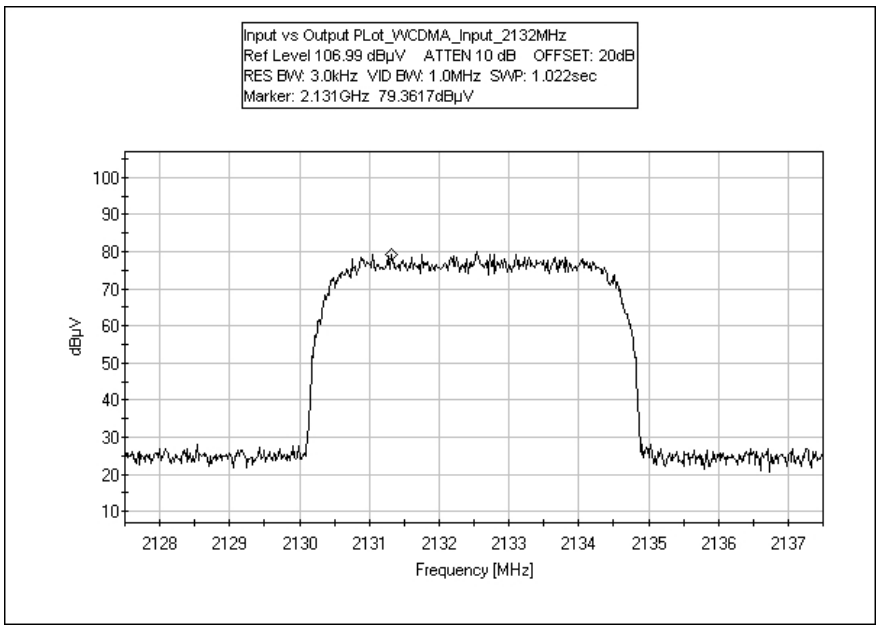
Engineer Name: E. Wong

Test Equipment				
Equipment	**Serial**	**Cal Date**	**Cal Due**	**Asset**
Spectrum Analyzer	MY46186290	2/21/2009	2/21/2011	AN02869
Cable	32022/2904K36TC	10/28/2009	10/28/2011	AN03174

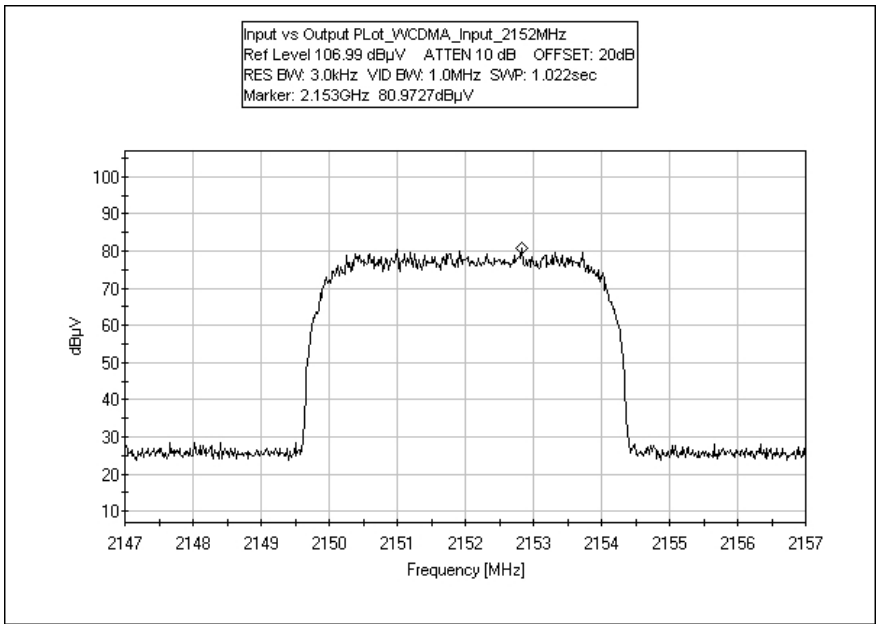
Test Data



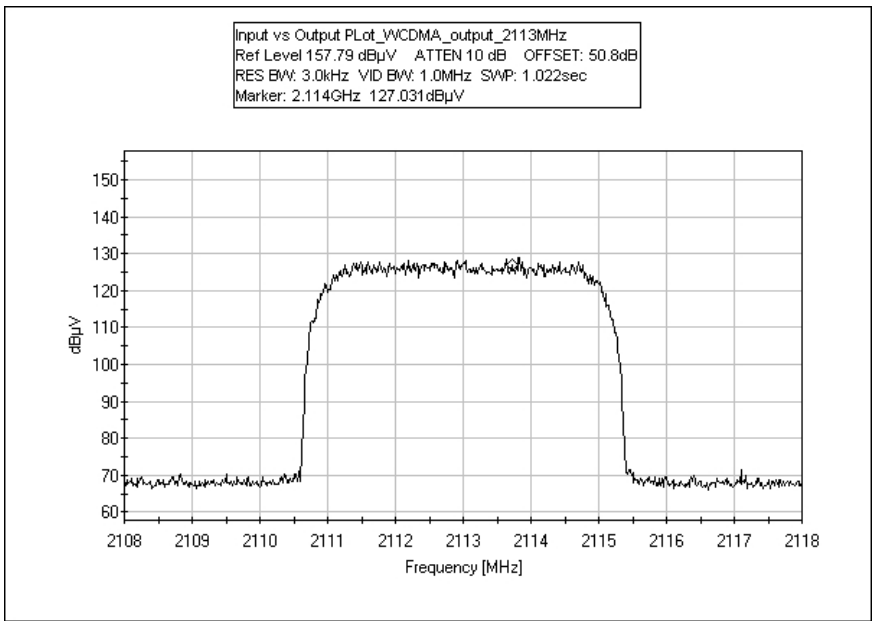
WCDMA INPUT 2113MHz



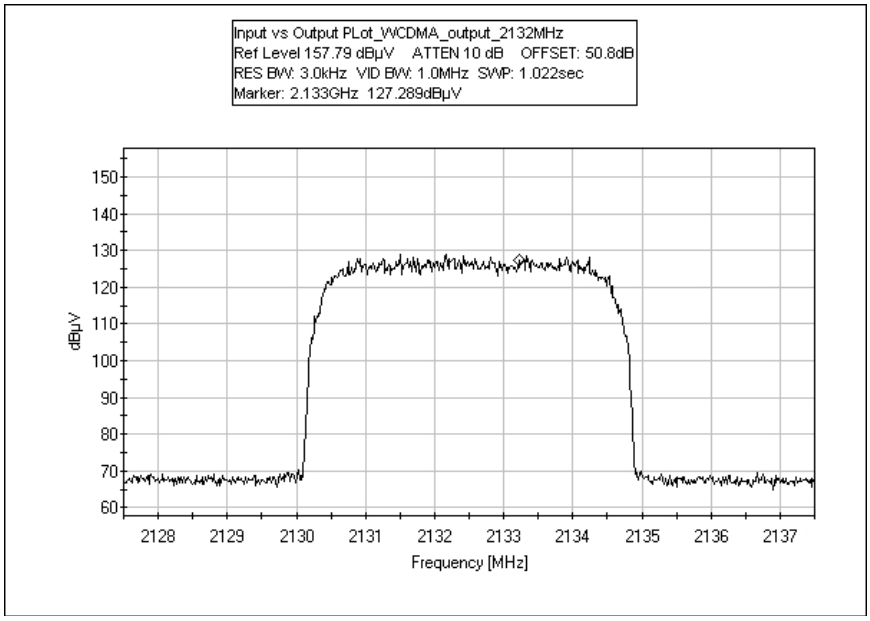
WCDMA INPUT 2132MHz



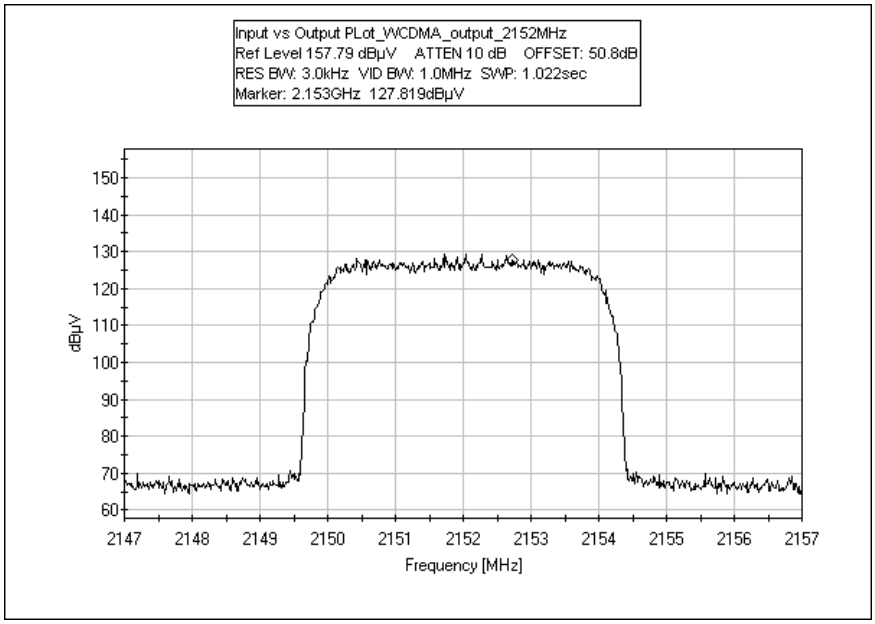
WCDMA INPUT 2132MHz



WCDMA OUTPUT 2113MHz



WCDMA OUTPUT 2132MHz



WCDMA OUTPUT 2152MHz

Test Setup Photos

INPUT/OUTPUT

2.1051 - Spurious Emissions at Antenna Terminal

Test Data

Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer:	**Powerwave Technologies**		
Specification:	**47 CFR §27.53(m) Spurious Emissions**		
Work Order #:	**88274**	Date:	7/28/2010
Test Type:	**Conducted Emissions**	Time:	11:56:48
Equipment:	**Nexus Dual Band Repeater**	Sequence#:	6
Manufacturer:	Powerwave Technologies, Inc.	Tested By:	E. Wong
Model:	RH905022/13B		110V 60Hz
S/N:	NA		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	2/21/2009	2/21/2011
	AN02744	High Pass Filter	11SH10-3000/T10000-O/O	3/5/2010	3/5/2012
	AN03174	Cable	16301	10/28/2009	10/28/2011
	ANdBuV	Unit Conversion		4/12/2010	4/12/2012

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Nexus Dual Band Repeater*	Powerwave Technologies, Inc.	RH905022/13B	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Pre Amp	Minicircuit	ZHL4240_SAM	D092397-19
Optical Converter Module	Powerwave Technologies, Inc	NA	NA
Signal generator	Aeroflex	IFR343B3	3410051078
Spectrum Analyzer	Agilent	8561EC	3946A00167

Test Conditions / Notes:

The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical in port is connected to a support Optical converter. The Support optical converter receives RF signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates an RF signal.
Power = 43dBm=20 watt
RF output port Service 1
Operating range: 2110-2155MHz.
Modulation: WCDMA (3GPP)
Freq = 2113MHz, 2132.5MHz, 2152 MHz
23°C, 52% Relative Humidity
The insertion loss of the RF attenuator was measured and compensated as measurement offset of the spectrum analyzer.
Frequency range of measurement = 9 kHz- 22 GHz.
Frequency 9 kHz - 150 kHz RBW=200 Hz, VBW=200 Hz; 150 kHz- 30 MHz RBW=9 kHz, VBW=9 kHz; 30 MHz- 1000 MHz RBW=120 kHz, VBW=120 kHz; 1000 MHz-22,000 MHz RBW=1 MHz, VBW=1 MHz
Detection was performed with reduced resolution bandwidth or with at the aid of High Pass Filter at the required resolution bandwidth.
No Emission found.

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: Antenna port

#	Freq	Rdng					Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBm	dBm	dB	Ant

Test Setup Photos

2.1051 CONDUCTED SPURIOUS EMISSIONS TEST SET UP

2.1053 - Field Strength of Spurious Radiation

Test Data

Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Powerwave Technologies**
Specification: **FCC 27.53 (h) Radiated Spurious Emission**
Work Order #: **88274** Date: 7/28/2010
Test Type: **Radiated Scan** Time: 10:56:53
Equipment: **Nexus Dual Band Repeater** Sequence#: 5
Manufacturer: Powerwave Technologies, Inc. Tested By: E. Wong
Model: RH905022/13B
S/N: NA

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	2/21/2009	2/21/2011
	ANdBuV	Unit Conversion		4/12/2010	4/12/2012
	AN01995	Biconilog Antenna	CBL6111C	3/8/2010	3/8/2012
	AN00309	Preamp	8447D	5/7/2010	5/7/2012
	ANP05050	Cable	RG223/U	4/16/2009	4/16/2011
	ANP05198	Cable	8268	1/5/2009	1/5/2011
T2	AN00849	Horn Antenna	3115	4/23/2010	4/23/2012
T3	AN00786	Preamp	83017A	7/28/2008	7/28/2010
T4	AN02948	Cable	32022-2-2909K-24TC	9/21/2009	9/21/2011
T5	ANP05565	Cable	ANDL-1-PNMN-54	9/4/2008	9/4/2010
	AN00314	Loop Antenna	6502	6/30/2010	6/30/2012
T6	AN02744	High Pass Filter	11SH10-3000/T10000-O/O	3/5/2010	3/5/2012
	AN01413	Horn Antenna	84125-80008	11/13/2008	11/13/2010

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Nexus Dual Band Repeater*	Powerwave Technologies, Inc.	RH905022/13B	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Pre Amp	Minicircuit	ZHL4240_SAM	D092397-19
Optical Converter Module	Powerwave Technologies, Inc	NA	NA
Signal Generator	Aeroflex	IFR343B3	3410051078
Spectrum Analyzer	Agilent	8561EC	3946A00167

Test Conditions / Notes:

The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical in port is connected to a support Optical converter. The Support optical converter receives RF signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates an RF signal.
Power = 43dBm=20 watt
RF output port Service 1
Operating range: 2110-2155MHz.
Modulation: WCDMA (3GPP)
Freq = 2113MHz, 2132.5MHz, 2152 MHz
23°C, 52% Relative Humidity
Frequency range of measurement = 9 kHz- 22 GHz.
Frequency 9 kHz - 150 kHz RBW=200 Hz, VBW=200 Hz; 150 kHz- 30 MHz RBW=9 kHz, VBW=9 kHz; 30 MHz- 1000 MHz RBW=120 kHz, VBW=120 kHz; 1000 MHz-22,000 MHz RBW=1 MHz, VBW=1 MHz

Operating Frequency:	794 MHz - 806 MHz			
Channels:	Low, Mid and High			
Highest Measured Output Power:	43.01	ERP(dBm)=	20	ERP(Watts)
Distance:	3	meters		
Limit:	43+10Log(P)=	56.01	dBc	

Freq. (MHz)	Reference Level (dBm)	Antenna Polarity (H/V)	dBc
4,306.08	-30.6	Horiz	73.61
4,306.08	-18.4	Horiz	61.41
6,394.27	-32.6	Vert	75.61
6,394.83	-36.4	Horiz	79.41
6,394.83	-25.5	Horiz	68.51
8,530.08	-36.9	Horiz	79.91
8,607.93	-37.8	Horiz	80.81
4,267.02	-38.8	Vert	81.81
6,342.37	-40.1	Horiz	83.11
6,342.37	-24.5	Horiz	67.51
4,266.92	-40.7	Horiz	83.71
4,266.92	-28.8	Horiz	71.81
8,451.50	-41.1	Horiz	84.11
4,223.95	-41.4	Horiz	84.41
4,223.95	-30.6	Horiz	73.61
7,593.07	-41.6	Vert	84.61
4,223.92	-42.5	Vert	85.51
6,335.90	-42.6	Vert	85.61
6,335.90	-30.1	Vert	73.11
4,306.10	-42.7	Vert	85.71
4,306.10	-31.3	Vert	74.31
8,451.90	-43.3	Vert	86.31
6,453.02	-44	Vert	87.01
6,453.02	-32.7	Vert	75.71
12,674.30	-46.1	Horiz	89.11
8,608.35	-46.6	Vert	89.61

LIMIT LINE FOR SPURIOUS RADIATED EMISSION

REQUIRED ATTENUATION = 43+10 LOG P (DB)

For radiated spurious emission measured at 3 meter test distance,

Required attenuation = 43+10 Log $P_{t\ at\ 3\ meter}$ dB
Limit line (dBuV) = E_{dBuv} - Attenuation

E_{dBuv} = Measured field strength at 3 meter in dBuV/m

Power Density (Isotropic)

$$P_D = \frac{P_t}{4\pi r^2}$$

P_D = Power Density in Watts /m^2
Pt = Average Transmit Power
r = Test distance

Field Intensity E (V/m)

$$E = \sqrt{P_D \times 377}$$

$$E = \frac{\sqrt{P_t \times 377}}{4\pi r^2}$$

$$E = \sqrt{\frac{P_t \times 30}{r^2}}$$

$$P_t = \left(\frac{E^2 \times r^2}{30} \right)$$

$10 \text{ Log } P_t = 10 \text{ Log } E^2 \text{ (V/m)} + 10 \text{ Log } r^2 - 10 \text{ Log } 30$

$10 \text{ Log } P_t = 20 \text{ Log E (V/m)} + 20 \text{ Log } r - 10 \text{ Log } 30$

At 3 meter, r = 3 m

$10 \text{ Log } P_t = 20 \text{ Log E (V/m)} + 20 \text{ Log } 3 - 10 \text{ Log } 30$

$10 \text{ Log } P_t = 20 \text{ Log E (V/m)} + 9.54 - 14.77$

$10 \text{ Log } P_t = 20 \text{ Log E (V/m)} - 5.23$

Since 20 Log E (V/m) = 20 Log E (uV/m) –120

$10 \text{ Log } P_t = 20 \text{ Log E (uV/m)} - 120 - 5.23$

$10 \text{ Log } P_t = 20 \text{ Log E (uV/m)} - 125.23$

Limit line (dBuV) at 3 meter = E_{dBuv} – Attenuation

= $E_{dBuv} - (43 + 10 \text{ Log } P_{t \text{ at 3 meter}})$

= $E_{dBuv} - 43 - 10 \text{ Log } P_{t \text{ at 3 meter}}$

= $E_{dBuv} - 43 - (20 \text{ Log E (uV/m)} - 125.23)$

= $E_{dBuv} - 43 - 20 \text{ Log E (uV/m)} + 125.23$

= $E_{dBuv} - 20 \text{ Log E (uV/m)} + 82.23$

Since 20 Log E (uV/m) = E in dBuV/m

= ~~E_{dBuv}~~ - ~~E_{dBuv}~~ + 82.23

Radiated Emission limit 3 meter = 82.23 dBuV at any power level measured in dBuV

Test Setup Photos

2.1053 RADIATED SPURIOUS EMISSIONS TEST SET UP

2.1053 RADIATED SPURIOUS EMISSIONS TEST SET UP

FCC_Bandedge

Test Set Up

The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical in port is connected to a support Optical converter. The Support optical converter receives RF signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates an RF signal.

Blockedge plot is recorded with a spectrum analyzer at the Antenna port of the device.

The resolution bandwidth of the spectrum analyzer was deduced to show compliance at bandedge with appropriate bandwidth correction applied.

The insertion loss of the RF attenuator was measured and compensated as measurement offset of the spectrum analyzer.

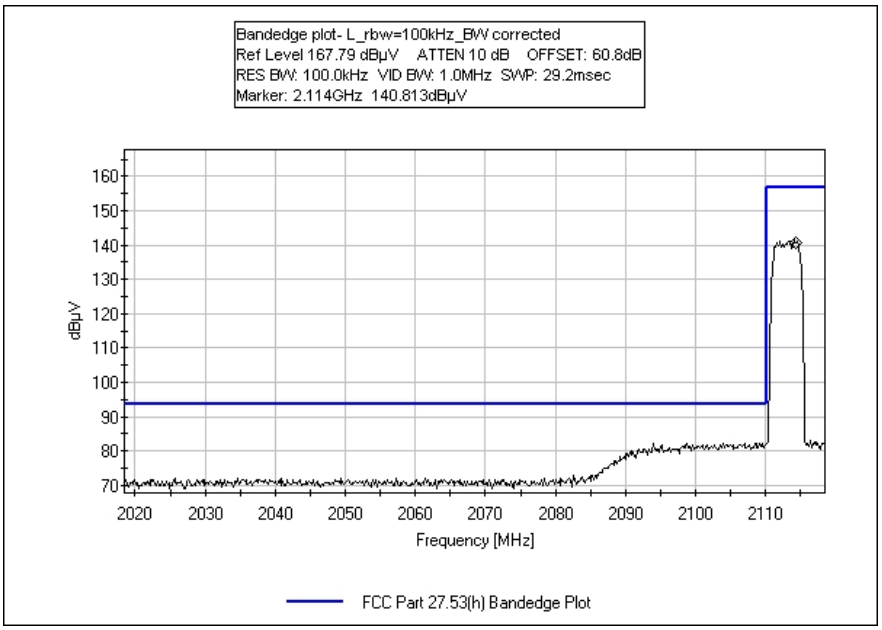
Operating range: 2110 - 2155MHz.
Power = 20 watt

Modulation: WCDMA, LTE
Freq = 2113MHz, 2132.5 MHz, 2152MHz MHz

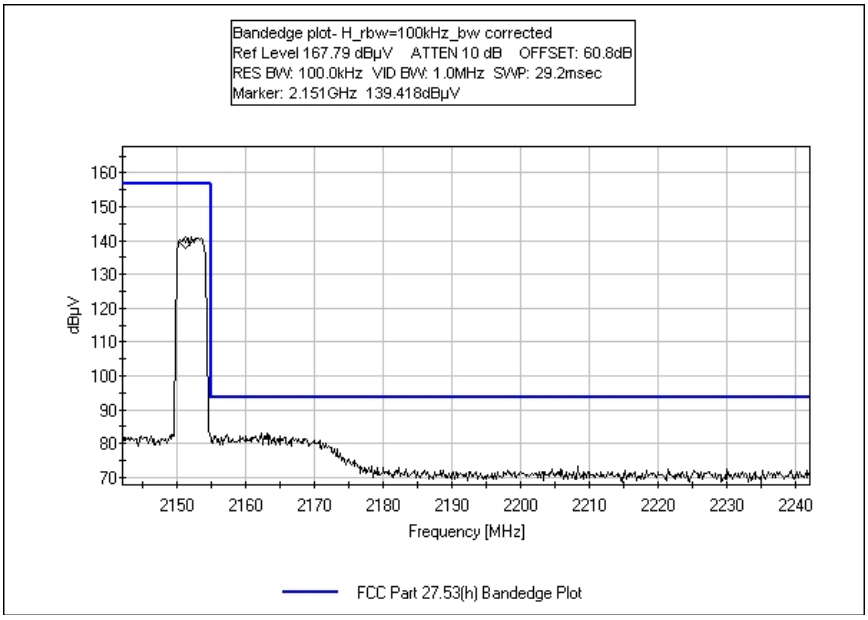
Engineer Name: E. Wong

Test Equipment				
Equipment	**Serial**	**Cal Date**	**Cal Due**	**Asset**
Spectrum Analyzer	MY46186290	2/21/2009	2/21/2011	AN02869
Cable	32022/2904K36TC	10/28/2009	10/28/2011	AN03174

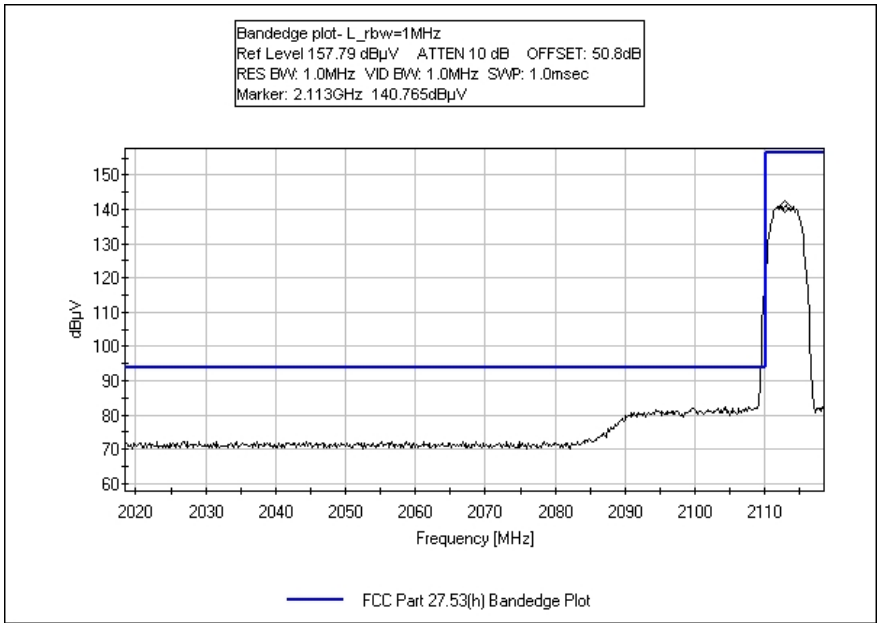
Test Data



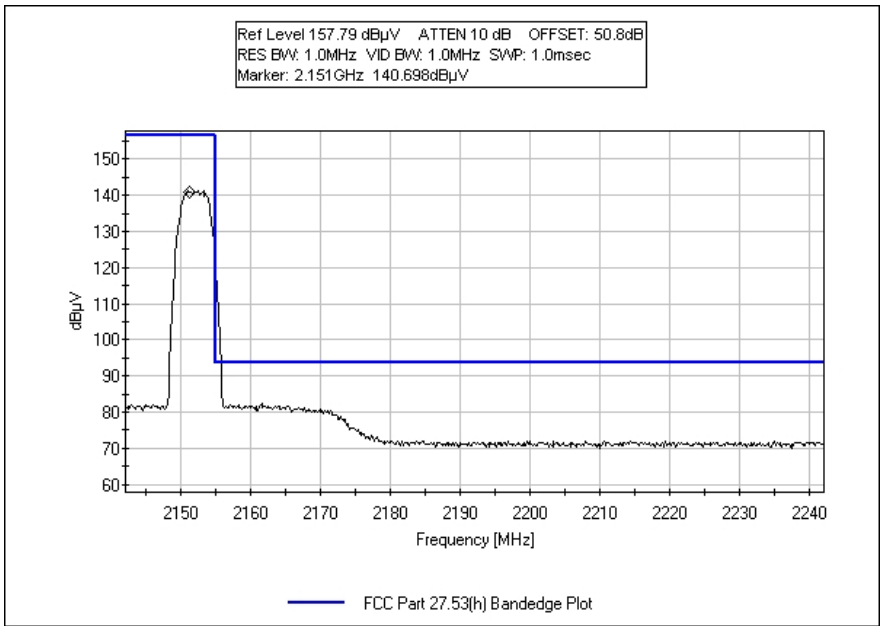
FCC_BANDEDGE L RBW=100kHz BANDWIDTH CORRECTED



FCC_BANDEDGE H RBW=100kHz BANDWIDTH CORRECTED



FCC_BANDEDGE – L RBW=1MHz



FCC_BANDEDGE – H RBW=1MHz

Test Setup Photos

FCC BANDEDGE TEST SET UP

Out of Band Rejection

Test Set Up

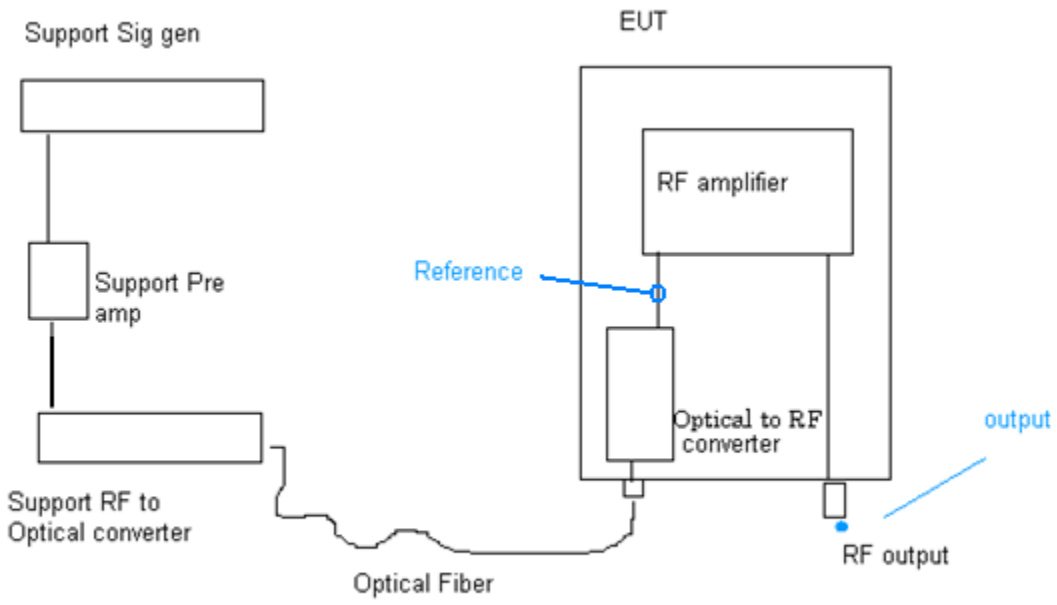
The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical port is connected to an Optical Converter. The Support optical converter receives the RF signal, converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal and generates a RF signal.

To measure the System RF gain, the reference was established at the input of the RF amplifier section, by- passing the optical convertor. The Out of band Rejection plot is captured with a Network Analyzer.

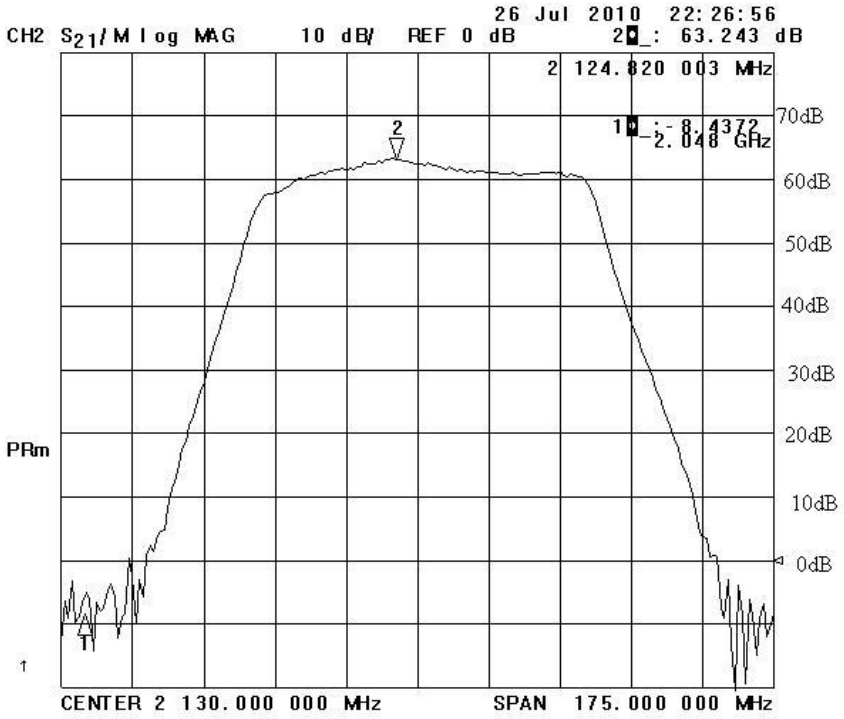
Engineer Name: E. Wong

Test Equipment				
Equipment	**Serial**	**Cal Date**	**Cal Due**	**Asset**
Network Analyzer	US37309342	07/27/10	07/27/12	C00024

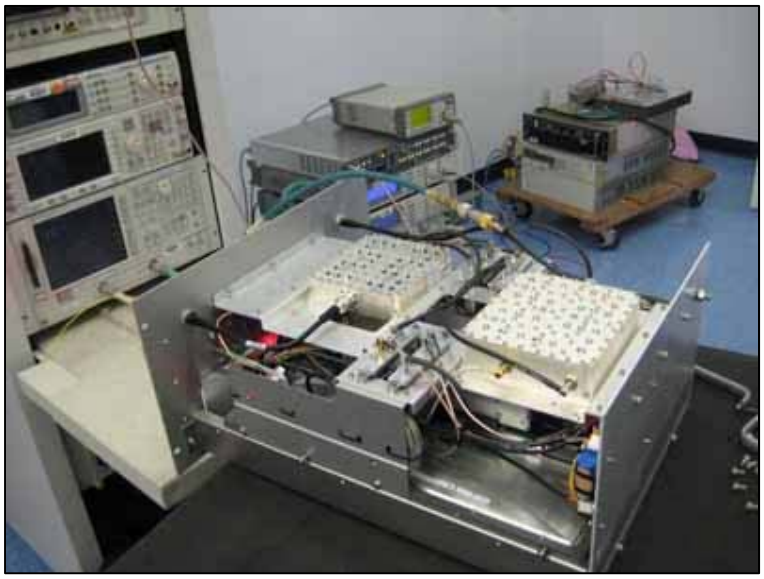
Out of band Rejection



Test Data



Test Setup Photos



OUT OF BAND REJECTION TEST SET UP

RSS - 131

99% Bandwidth

Test Set up

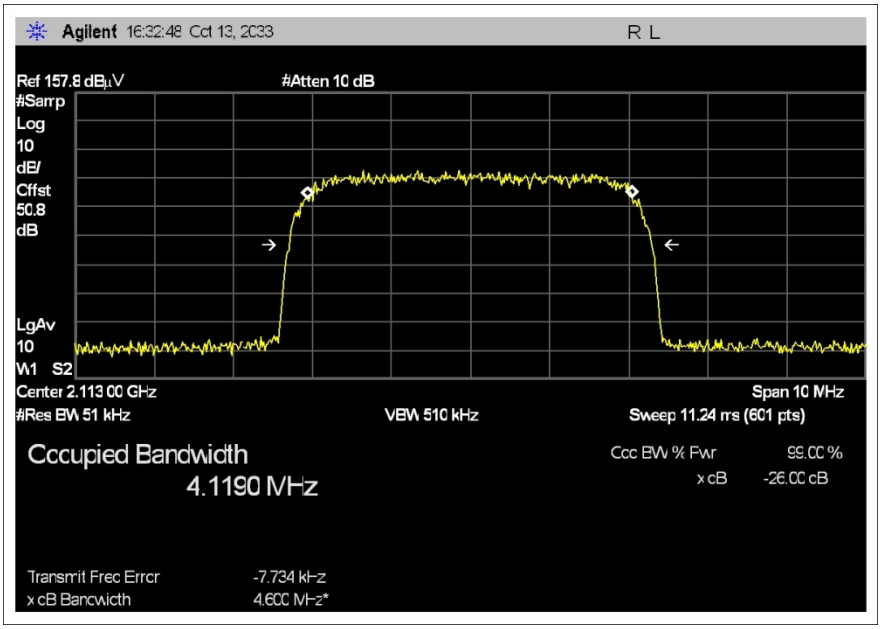
The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical in port is connected to a support Optical converter. The Support optical converter receives RF signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates an RF signal.

99% Bandwidth is recorded with a spectrum analyzer at the Antenna port of the device.
The insertion loss of the RF attenuator was measured and compensated as measurement offset of the spectrum analyzer.

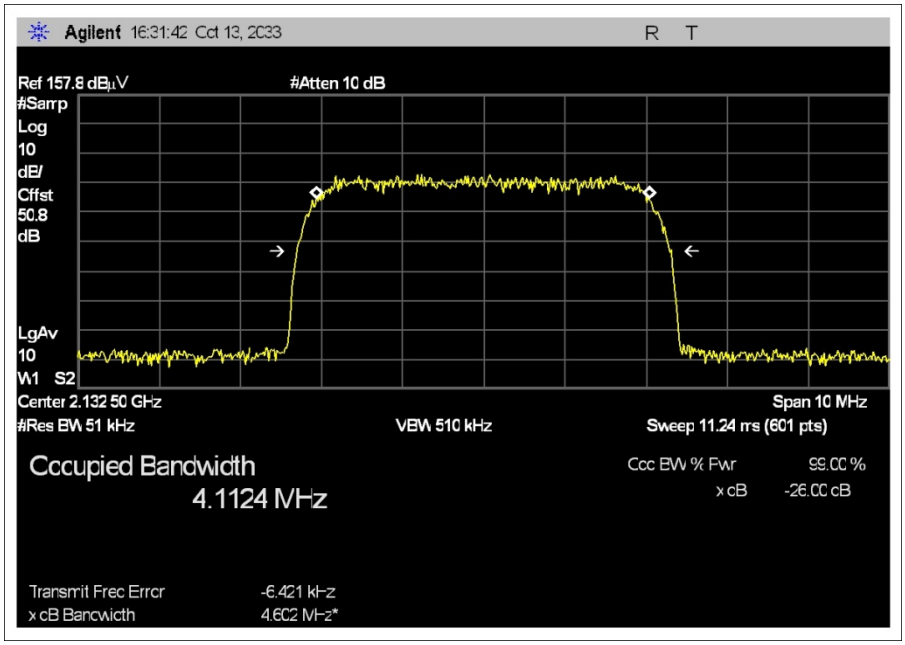
RF output port Service 1
Operating range: 2110-2155MHz
Modulation: WCDMA
Freq = 2113.0MHz, 2132.5MHz, 2152.0 MHz

Test Equipment				
Equipment	**Serial**	**Cal Date**	**Cal Due**	**Asset**
Spectrum Analyzer	MY46186290	2/21/2009	2/21/2011	AN02869
Cable	32022/2904K36TC	10/28/2009	10/28/2011	AN03174

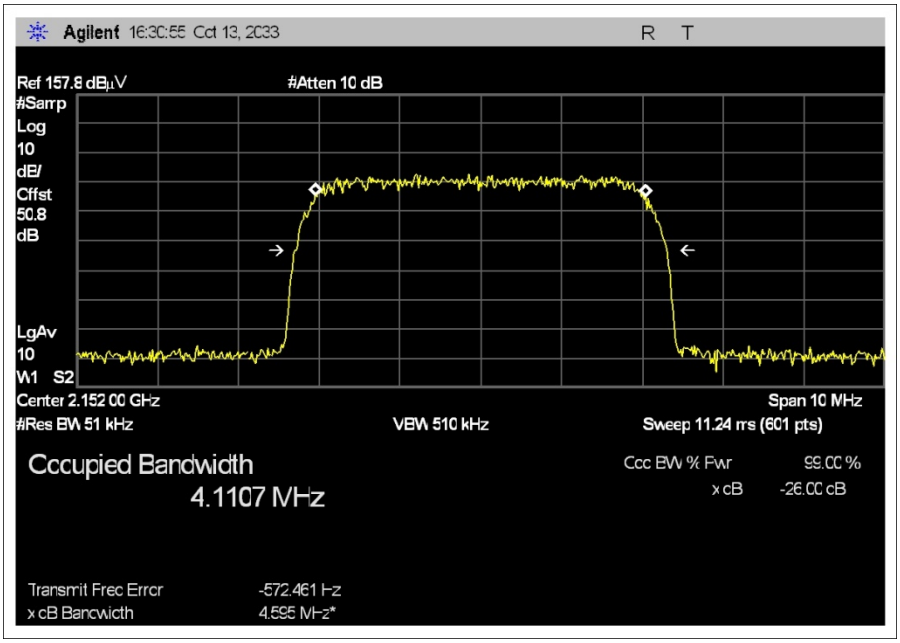
Test Data



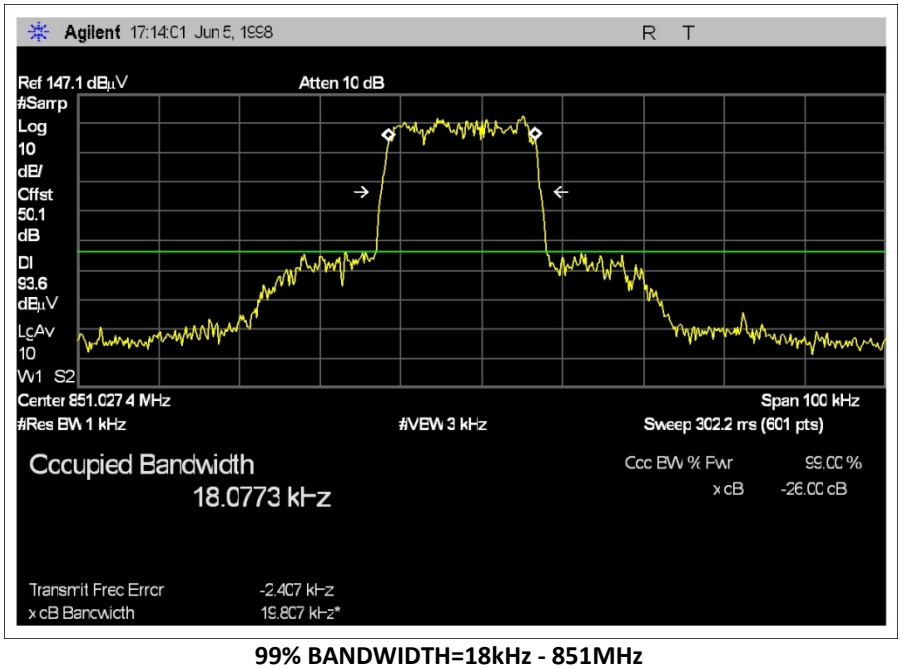
99% BANDWIDTH WCDMA 2113MHz



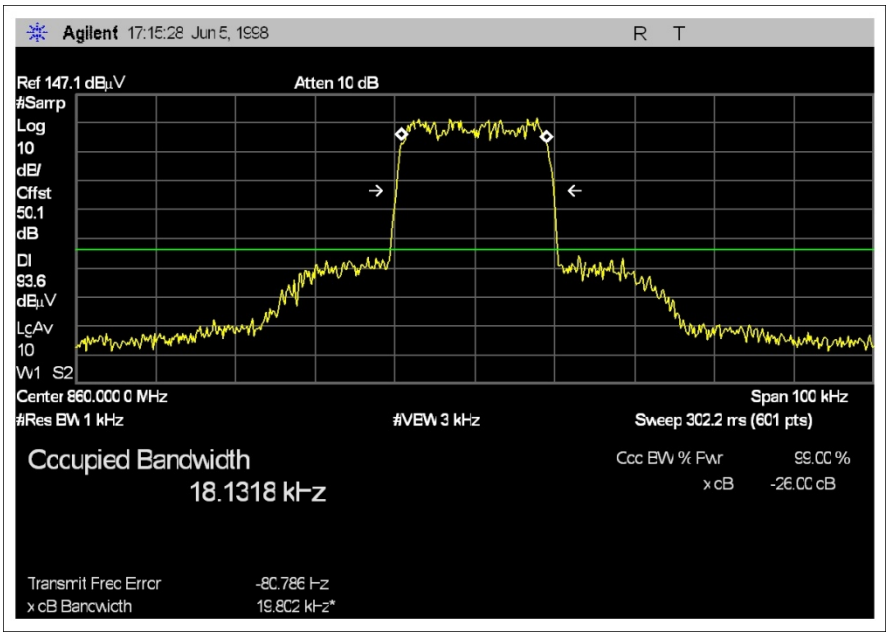
99% BANDWIDTH WCDMA 2132MHz



99% BANDWIDTH WCDMA 2152MHz



99% BANDWIDTH=18kHz - 851MHz



99% BANDWIDTH=18kHz - 860MHz

Test Setup Photos

99% BANDWIDTH

Amplifier Gain and Bandwidth

Test Set up

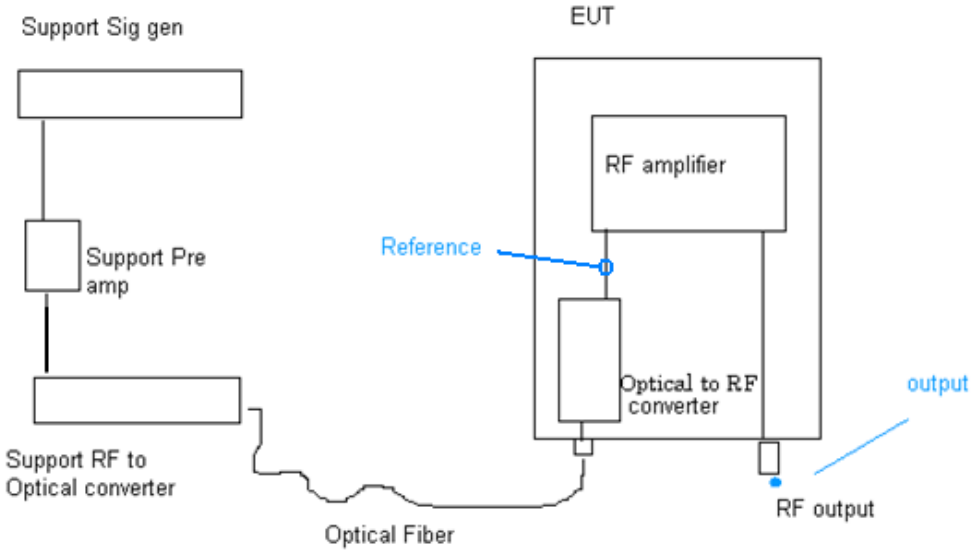
The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical port is connected to an Optical Converter. The Support optical converter receives the RF signal, converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal and generated a RF signal.
To measure the System RF gain, the reference was established at the input of the RF amplifier section, by- passing the optical convertor. The manufacturer declared gain is system RF gain. The system RF gain is measured with a Network Analyzer.

The nominal bandwidth and nominal pass band gain (dB) of the RF enhancer or translator shall be stated by the manufacturer or equipment certification applicant and indicated in the test report.

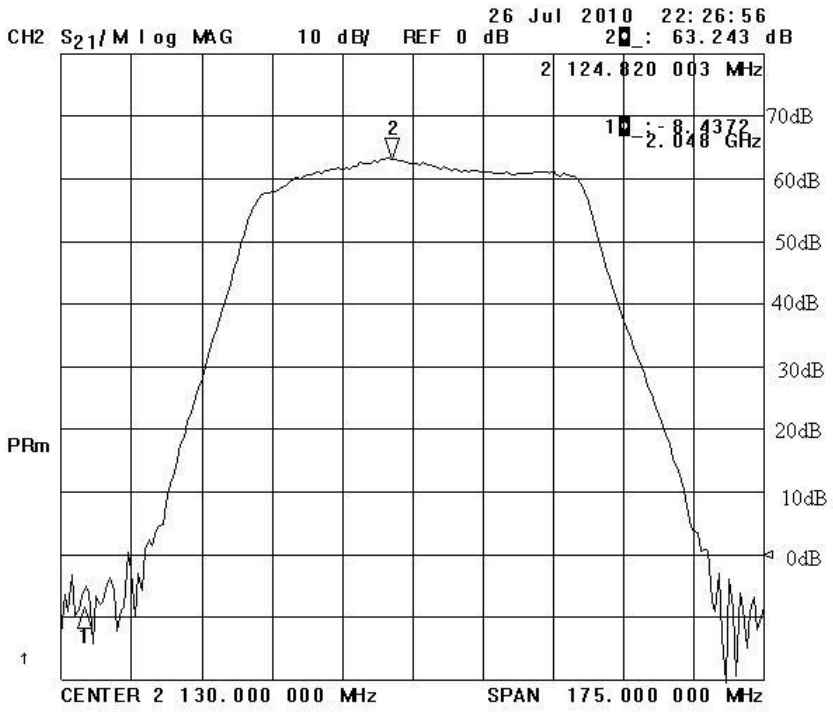
Engineer Name: E. Wong

Test Equipment				
Equipment	**Serial**	**Cal Date**	**Cal Due**	**Asset**
Network Analyzer	US37309342	07/27/10	07/27/12	C00024

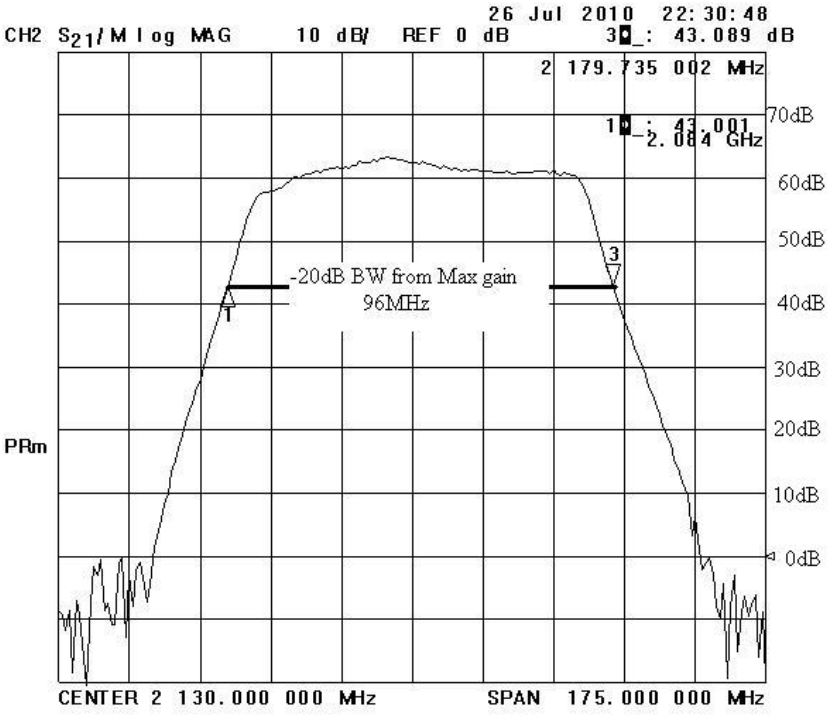
Amplifier Gain and Bandwidth



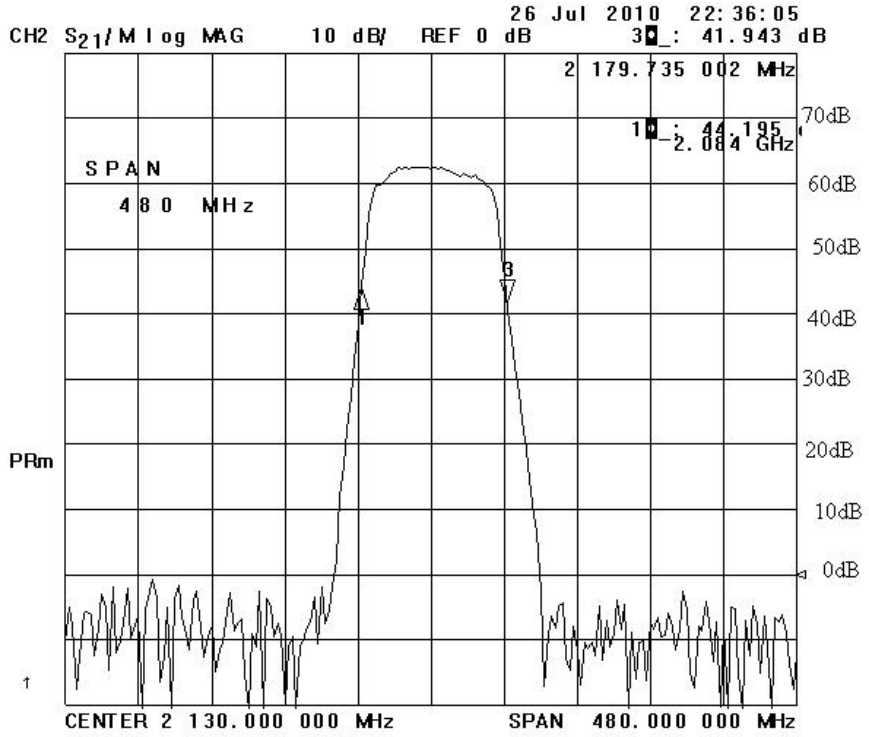
Test Data



The internal control is adjusted to the nominal gain for which equipment certification is sought.



With the aid of a network analyzer, the 20 dB Bandwidth is measured.

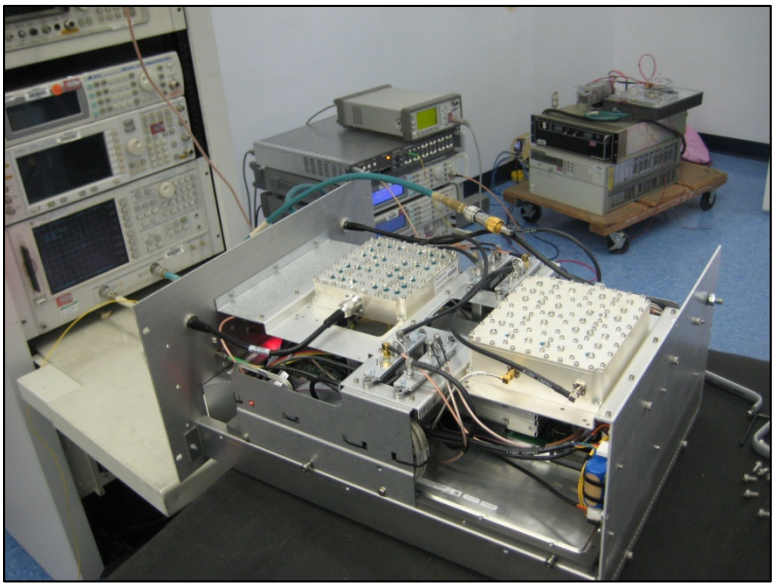


The gain-versus-frequency response of the amplifier from the mid band Fo of the pass band up to at least fo + - 250% of the 20dB Bandwidth.

Minimum standard:
The pass band gain response shall not exceed the nominal gain by more than 1 dB. The 20 dB bandwidth shall not exceed the nominal bandwidth that is stated by the manufacturer.

Outside of the 20dB bandwidth the gain shall not exceed that at the 20dB point.

Test Setup Photos



AMPLIFIER GAIN AND BANDWIDTH TEST SET UP

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

The reported measurement uncertainties are calculated based on the worst case of all laboratory environments from CKC Laboratories, Inc. test sites. Only those parameters which require estimation of measurement uncertainty are reported. The reported worst case measurement uncertainty is less than the maximum values derived in CISPR 16-4-2. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the highest readings, this is indicated as a "QP" or an "Ave" on the appropriate rows of the data sheets. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer/receiver readings recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the measuring device called "peak hold," the measuring device had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the quasi-peak detector.

Average

For certain frequencies, average measurements may be made using the spectrum analyzer/receiver. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.